

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)	
)	
Reliability and Continuity of)	PS Docket No. 11-60
Communications Networks, Including)	
Broadband Technologies)	

To: The Commission

**REPLY COMMENTS OF
THE BOULDER REGIONAL EMERGENCY TELEPHONE SERVICE AUTHORITY
COMMENTS ON IMPROVING WIRELESS NETWORK RESILIENCY**

The Boulder Emergency Telephone Service Authority (“BRETSA”),¹ by its attorney, hereby submits it’s Reply Comments on improving wireless network resiliency in response to the Commission’s April 1, 2019 Public Notice in the above-referenced docket.²

I. Wireless Network Resiliency Should Prevent Outages As Well As Facilitate Service Restoration.

Wireless network resiliency is about more than just expeditious restoration of service after an outage; it is also about continuity of service. This is particularly important in the context of 9-1-1, as wireless calls account for over 90% of all 9-1-1 calls in some PSAPs.

Given wireless’ dominance of the telephony market and the diminishing number of wireline phones in service; what is the public to do in the event of an emergency or natural disaster when wireless networks fail? How are they to reach First Responders when they require assistance? Residents in Colorado were faced with this very question on September 12, 2013 when floods washed away one of the few roads leading into the mountains the town of Estes

¹ BRETSA is the Colorado 9-1-1 Authority serving Boulder County, Colorado.

² *Public Safety and Homeland Security Bureau Seeks Comment on Improving the Wireless Resiliency Cooperative Framework*, DA 19-242 (rel. Apr. 1, 2019).

Park and Rocky Mountain National Park (“RMNP”), and the single CenturyLink interoffice facility serving the Estes Park area and beyond.³ Wireline subscribers in the Estes Park area in need of Emergency Response due to the flood or otherwise were able to call within the area. Wireless subscribers were unable to call *anyone*.

When the road and the interoffice facility buried in the road’s right of way was washed away, the single connection between the Central Office and switch serving Estes Park and environs and the rest of the PSTN and Colorado 9-1-1 Selective Routers was severed; the Estes Park Central Office was isolated. The Allenspark, Colorado Central Office and switch’s sole interoffice connection is with the Estes Park switch, and thus was also isolated.

While the Estes Park and Allenspark areas were isolated from the rest of the PSTN, wireline customers could continue to make *local* calls through the Estes Park and Allenspark switches. Wireline customers’ *9-1-1 calls* could not initially be completed, however, because the interoffice facilities connecting the Estes Park Central Office with the rest of the PSTN was severed and 9-1-1 calls could not be delivered to the Colorado 9-1-1 Selective Routers.

CenturyLink is the Specialized Service Provider (“SSP”) in Colorado, termed the “Basic Emergency Service Provider” (“BESP”) under Colorado law. Though delayed entering the flood-affected area lest they interfere with rescue operations, CenturyLink technicians implemented “Condition 4 Routing” in the Estes Park/RMNP and Allenspark areas. The Condition 4 Routing programmed the Estes Park switch to route wireline 9-1-1 calls originating in the Estes Park area to the 10-digit numbers assigned to the administrative lines of the Estes Park PSAP.⁴ The

³ The population of Estes Park and environs is approximately 6,000, while RMNP is visited by approximately 4 million tourists annually.

⁴ Wireline customers in the Estes Park area would have been able to directly contact the Estes Park PSAP on administrative lines prior to implementation of Condition 4 Routing, if they thought to do so instead of dialing 9-1-1.

Condition 4 Routing programmed the Allenspark switch to route wireline 9-1-1 calls originating in the Allenspark area to be routed to Allenspark Fire Station No. 1.⁵

CenturyLink was able to obtain temporary use of fiber optic facilities in the Estes Park area owned by a power company, and on September 16, 2013 restored the interoffice link from Estes Park to the rest of the PSTN and the 9-1-1 Selective Routers. BRETSA understands the power company had previously been unwilling or unable to provide capacity on its fiber optic facilities to telecommunications providers.

It was not only wireline telephone subscribers who were impacted by the severing of the interoffice facility however. Transport facilities for backhaul of wireless calls and some broadband VoIP calls originating in the Estes Park/RMNP and Allenspark area to the wireless providers' regional or national Mobile Switching Centers ("MSCs"), or the Internet and broadband providers' VoIP Routing Function, were also washed away with the above-mentioned road and CenturyLink Interoffice facilities. Once these backhaul facilities were washed away, wireless and VoIP calls originating in the Estes Park/RMNP and Allenspark areas could not reach the MSCs or VoIP Routing Functions and be routed to *any* destination.

While the lines connecting the wireless-provider cell sites and broadband-provider head ends to the interoffice fiber run through the Allenspark and/or Estes Park Central Offices, those lines are not connected to the Central Office switches. Until a call path to the MSCs and VoIP Routing Functions was restored, the wireless and VoIP customers were unable to complete calls *to anyone*, including 9-1-1.⁶

⁵ 9-1-1 calls from the Allenspark area are normally routed to the Boulder County Sheriff's Department Dispatch Center.

⁶ BRETSA has participated in Colorado PUC proceedings and monitored ongoing efforts to identify or place a diverse path to Estes Park and Allenspark. To BRETSA's knowledge, the only existing diverse path to Estes Park is the above-mentioned power company facility, which was not made available for use by telecommunications providers prior to the 2013 floods.

Due to the cost of constructing interoffice facilities in the mountainous area of Estes Park and Allenspark, CenturyLink's charges for placement of diverse interoffice facilities would be prohibitive for the affected 9-1-1 Authorities. CenturyLink has reestablished a permanent interoffice facility to Estes Park, but continues to use power company fiber on a temporary basis for a diverse path while it seeks a more feasible permanent solution for path diversity. BRETSA understands that when stakeholder meetings were held to assess available support for construction of a permanent diverse Interoffice path to Estes Park, some but not all wireless and VoIP providers attended: none committed to assist in funding placement of diversely routed facilities to Estes Park.

BRETSA has learned that Estes Park and Allenspark are just two examples of local calling areas (wireline, wireless and VoIP service) in Colorado which are not protected by diversely routed interoffice connections. In PUC Proceeding No. 19M-0026T, CenturyLink and Colorado 9-1-1 Authorities are working to prioritize the unprotected Central Offices which serve PSAPs, and develop a new tariff and process for deploying diverse interoffice paths to these Central Offices.

Based on BRETSA's participation in these workshops, it appears to BRETSA that it will take years and millions of dollars just to place diverse facilities to the unprotected Central Offices which serve PSAPs. There are additional unprotected Central Offices in Colorado which do not serve PSAPs. It does not appear diverse backhaul facilities are available for wireless providers serving these Central Office serving areas either.

There are certainly other states with mountainous and/or sparsely populated areas which have unprotected Central Offices. Indeed, according to the Public Safety and Homeland Security

Bureau's Report on Hurricane Michael's Impact on Communications, wireless service (including wireless calls to 9-1-1, was affected more by damage to backhaul facilities than to cell sites.⁷

During 2015-16 workshops in Colorado PUC rulemaking proceeding 15R-0318T, counsel for BRETSA asked representatives of wireless providers about the level of diversity in their backhaul networks. The representatives would only protest that diverse facilities to their cell sites was a non-starter, and would substantially increase the cost to consumers of wireless service.⁸ The concern, however, is not with path diversity to *cell sites*. Cell sites are themselves diverse so that the loss of one cell-site does not necessarily disrupt communications.⁹ Traffic from *cell sites* to MSCs is obviously multiplexed or concentrated at some point. The question is to what extent is the wireless backhaul call-path from the point of aggregation or concentration to the MSC protected by diverse facilities?

BRETSA believes that where there is a lack of wireline, wireless, and VoIP backhaul path diversity between aggregation points in a local calling area and the MSC (or VoIP Routing Function), including in LEC interoffice facilities used for backhaul, wireless and VoIP providers should contribute to the costs of placing a shared diverse path. The vast majority of 9-1-1 calls are wireless calls. When unprotected backhaul facilities for wireless and VoIP traffic are severed,

⁷ October 2018 Hurricane Michael's Impact on Telecommunications: Preparation, Effect, and Recovery, Report and Recommendations, A Report of the Public Safety and Homeland Security Bureau, Federal Communications Commission in Public Safety Docket No. 18-339 (May 2019), at 4 paras. 5-6, 13 para. 27, 14-16 paras. 30-32 ("[In Gulf County Florida,] [a]s in Bay County, backhaul damage was the largest and most persistent cause of cell site outages.")

⁸ See, e.g., Transcript of November 19, 2015 Workshop in Colorado Public Utilities Commission Proceeding 15R-0318T, page 32 line 2 -page 36, line 20, available at: https://www.dora.state.co.us/pls/efi/EFI_SEARCH_UI.SEARCH?p_session_id=&p_results=Documents&p_proceeding_number=15R-0318T&p_document_type=Choose%20One&p_docket_status=Choose%20One&p_decision_type=Choose%20One&p_decision_author=Choose%20One&p_auto_search=Y (last checked May 17, 2019).

⁹ BRETSA understands that if a cell site goes down, user devices may be able to connect to other cell sites in the general area, or even more distant cell sites through SMS text including SMS text-to-911. However, even if a wireless provider deployed a Crosby Tower System (a precast hardened tower with a total accumulated overturning momentum greater than 7.5 million foot pounds which houses antennas and auxiliary generators or batteries inside a radome capable of withstanding 167 mph winds), continuity of service would still be vulnerable to severing of unprotected (non-diverse) backhaul facilities.

wireless and VoIP customers cannot reach 9-1-1, local (ten digit) public safety numbers, *or any other number*.

II. Network Resiliency Should Also Allow Continued Communication *During* Network Impairments.

In the SMS Text-to-911 rulemaking proceeding, the University of Colorado Interdisciplinary Telecommunications Program submitted comments demonstrating, *inter alia*, the ability of SMS text messages to be successfully transmitted in areas where there is an insufficient signal to place a voice call:

Weak Signal Environments. A question that has been raised by communications researchers is, “Are there any circumstances when a voice call cannot ‘connect’ or ‘go through,’ but a text message can?” On the edge of a mobile phone signal coverage (where a phone might display “no bars”), or when the mobile phone signal is heavily obstructed, such as when the caller is in the mountains, in the midst of high rise buildings, inside a building, *under a collapsed building* following an earthquake or explosion, or in a trunk of a car, closet, container, etc., the signal is weak. The CU Team found that, in the case of fixed stationary antennas, there exist a signal threshold above which both a voice call or text message can communicate and below which neither can communicate. However, for a handheld mobile phone, the signal will vary with even small movements. In this situation, the CU Team observed cases when a weak signal existed and text messages got through while voice calls did not. Communication at the edge of coverage can be sporadic, allowing only momentary windows of communications coverage that are not long enough to support a voice call but a short burst of a text message can get through. In addition, some implementations of SMS automatically keep trying to send a text message until a transmission window opens.

CU Comments, PS Docket Nos. 10-255 and 11-153 (filed December 12, 2011), at 3 (*Emphasis added*), available at: <http://apps.fcc.gov/ecfs/document/view?id=7021750484> (last viewed May 15, 2019).

The ability to successfully transmit and receive SMS text messages in locations where wireless voice calls cannot be completed is not only a universal experience among wireless users; it has also been demonstrated through mountain and backcountry rescues. SMS text-to-911 has become important for the general population and not just for the deaf and hard-of-

hearing community. On November 6, 2015, Bruce Romero, formerly Emergency Dispatch Director of the Aspen-Pitkin County Communications Center (now Executive Director of the Colorado 911 Resource Center) spoke on a panel on Text-to-911 at the Resource Center's "911 Goes to Denver" event. The Aspen-Pitkin County Communications Center was the first PSAP to implement Text-to-911 in Colorado, in October, 2013. Mr. Romero has stated that approximately 80 percent of Text-to-911 "calls" received by the Aspen-Pitkin County PSAP since implementation were from individuals who were unable to get a voice connection, including backcountry rescue situations. He stated that as of the date of the 911 Goes to Denver event, the PSAP had received only two text-to-911 calls from speech and hearing impaired individuals, even though Aspen Camp of the Deaf and Hard of Hearing is located within the jurisdiction (the Camp is not located in an area with CMS service, but individuals attending the camp also travel beyond the camp premises and throughout Aspen and Pitkin County).¹⁰

BRETSA initially became concerned that emulated SMS provided over the same wireless channel used for voice communications in an LTE-IMS environment would provide no greater coverage than wireless voice. A representative of BRETSA put the question to John Snapp of Intrado (now West Safety Services) during a session at the 2013 Colorado APCO/NENA State Conference. Mr. Snapp stated that there would still be an increased margin of text messaging coverage over voice coverage, but a very slight margin.

RTT is a session based service like voice, and in fact voice-over-text capability is a feature of RTT. This would appear to distinguish RTT from SMS in that a persistent connection

¹⁰ A video recording of the 911 Goes to Denver Panel is available at <https://sites.google.com/a/co911rc.org/co911rc/issues-summit/past-events/2015-911-goes-to-denver>, Sessions, Part 1 (last viewed May 15, 2019). At approximately 11:10 to 14:30 of the video, Mr. Romero and Jennifer Kirkland, Operations Support Supervisor, Vail Public Safety Communications Center, discuss receipt of Text-to-911 calls for backcountry rescue and other situations where callers cannot get a sufficient signal to make a voice call, versus Text-to-911 calls from speech and hearing-impaired individuals.

is required, as with emulated SMS in an LTE-IMS environment. Thus in an emergency, even if the nearest cell sites are down SMS text messages including text-to-911 may reach much more distant cell sites than can voice calls or RTT messages.

BRETSA has raised the issue of the impact on the replacement of SMS text-messaging with emulated text-messaging in an LTE-IMS environment or RTT many times. BRETSA raised this issue in its Comments of the Boulder Regional Emergency Telephone Service Authority on Policy Statement and Second Further Notice of Proposed Rulemaking Regarding Text To 9-1-1, filed April 4, 2014 in PS Docket No. 11-153, at 40, *available at* <https://ecfsapi.fcc.gov/file/7521096988.pdf> (last checked May 15, 2015), and the Commission requested comment on the issue:

BRETSA asserts that, in the "transition to LTE-IMS, wireless systems will provide emulated SMS messaging over a data channel rather than true SMS messaging over a control channel," resulting in the loss of additional coverage area. We seek comment on how the deployment of LTE networks by CMRS providers will affect their text messaging coverage areas.

In re Facilitating the Deployment of Text-to-911 Applications, 29 FCC Rcd 9846, 9899 fn. 36, 2014 FCC LEXIS 2980, *187, 61 Comm. Reg. (P & F) 1 (citation omitted). It speaks loudly that no wireless provider chose to address the issue.

In its September 22, 2011 Notice of Proposed Rulemaking in PS Docket No. 11-153, *Facilitating Deployment of Text-to-911 and Other Next Generation 911 Applications*, the Commission noted that in an emergency when networks become overloaded with voice calls and individuals cannot place voice calls, text messaging which requires much less bandwidth can permit ongoing communications. The Commission stated:

Improved reliability and resiliency. In large-scale disasters, circuit-switched landline and mobile networks may become overloaded, making it more difficult to place a 911 voice call. As landline and mobile networks migrate from circuit-switched to IP-based packet-switched technology, the risk of overload or

congestion may dissipate, but in the interim, enabling SMS and IP-based text messages to 911 could be beneficial because text consumes far less bandwidth than voice and may use different spectrum resources or traffic channels. Thus, people in disaster areas may still be able to send text messages to 911 even if they cannot place a voice call. Similarly, with improved technology, PSAPs may be able to filter text messages by incident, so that they spend less time with voice callers who report the same incident. We seek comment on the prospective impact of text messaging on PSAP operations and emergency response during large-scale disasters, with particular emphasis on experiences of overload-induced 911 failures. For example, there have been news reports that cell phone service, including the ability to reach 911, was impaired immediately after the August 23, 2011 East Coast earthquake, while SMS and email did not experience service disruptions.

In re Facilitating the Deployment of Text-To-911 & Other Next Generation 911 Applications, 26 FCC Rcd 13615, 13631-13632, 2011 FCC LEXIS 3898, *48-49 (September 22, 2011) (footnotes omitted). The Commission has previously recognized that *SMS* text messaging is critical to wireless resiliency.

In addition, PSAPs have a limited number of call-taking positions and a limited number of dispatchers. PSAP text-to-911 interfaces may provide efficiencies in reviewing and responding to high volumes of SMS text messages during emergencies.

III. Conclusion.

Wireless resiliency must include hardening against outages, and the ability to continue to handle calls and messages when the system is compromised due to localized outages and high call volumes. With the long transmission paths from local service areas to regional or national MSCs, backhaul path diversity is critical to wireless resiliency. True SMS text messaging is also critical to continued communications over wireless systems during outages or periods of high call volumes. BRETSA urges the Commission to (i) investigate the extent to which path diversity exists between local calling areas and MSCs, (ii) require wireless and broadband providers to contribute to the cost of deploying shared diverse facilities to local service areas

where they provide wireless or VoIP service, and (iii) provide for the continuation of SMS text messaging as and after wireless providers offer RTT and transition to LTE-IMS.

Respectfully submitted,

**BOULDER REGIONAL EMERGENCY
TELEPHONE SERVICE AUTHORITY**

By: 

Joseph P. Benkert

Joseph P. Benkert, P.C.

8506 Porcupine Pointe

Parker, CO 80134

(303) 948-2200

Its Attorney

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